

**2016 Children's Safe Products - Reporting Rule update**  
**Draft Chemical Evaluation**

**CAS** 13674-84-5

**Substance Name** Tris (2-chloroisopropyl) phosphate (**TCPP** or TCIPP)

**Toxicity**

EPA classified Tris (2-chloroisopropyl) phosphate (TCPP) as high hazard for reproductive and developmental effects based on increased estrus cycle length, decreased uterine weights, and increased number of runts at the 99 mg/kg dose in a 2-generation oral rat study [1, 2]. TCPP has not been tested for cancer but is structurally similar to TDCPP and TCEP<sup>1</sup> which are both demonstrated animal carcinogens [2]. The National Institutes of Health's National Toxicology Program (NTP) has a cancer assay underway to fill this important data gap [3].

Only limited toxicity testing results for TCPP were identified in a review by the US Agency for Toxic Substances and Disease Registry (ATSDR) in 2012 [4]. A 1982 study by Kawasaki H, et al. reported that oral dosing in pregnant rats up to 893 mg/kg-day on gestation days 0-20 had no significant effects on the number of implantations or resorptions, fetal weight, external malformations, or pup survival and growth in the first 4 postnatal weeks [4].

**Exposure**

TCPP is an additive flame retardant used in polyurethane furniture foam, textiles, apparel, leather, electronics, and rigid polyurethane foam insulation and roofing laminates used in building construction [3]. Commercial TCPP is a mixture of isomers: primarily CAS 13674-84-5, with lesser amounts of CAS 76025-08-6, and 76649-15-5 [3]. The U.S. national production volume of TCPP was reported to be 54,673,933 pounds in 2012 [3, 5].

TCPP has been detected in U.S. household furniture and in baby products including: polyurethane foam in car seats, changing table pads, sleep positioners, portable mattresses, nursing pillows and children's furniture [6-8]. Detection rates in foam are reported to be 0.5-2.2% by weight in furniture foam; 1-14% in baby product foam [3, 8].

TCPP has been detected, often with high frequency, in indoor house dust and air by multiple studies in North America [8-12]. Median and mean levels in dust are frequently in the low parts per million (µg/g) with detections up to 140 µg/g dust. Reported air concentration of inhalable TCPP particulate (defined as >4µm) ranged up to 1.36 µg/m<sup>3</sup> in home indoor air [9]. TCPP has been detected in a variety of foods in the U.S. FDA total diet study at low levels (< 7 ppb).

In biomonitoring studies, two metabolites of TCPP have been measured and detected in human urine: bis (1-chloro-2-propyl) phosphate (BCIPP) and 1-hydroxy-2-propyl bis(1-chloro-2-propyl) phosphate (BCIPHIPP). One or both were detected in toddlers and their mothers in New Jersey [13], infants in North Carolina [14], mothers and their children in California [15] and in adults in Northern California

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<sup>1</sup> TDCPP - Tris(1,3-dichloro-2-propyl)phosphate; TCEP - Tris(2-chloroethyl) phosphate

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[16]. While the frequency of detection and levels detected are generally low for the BCIPP metabolite, a recent study measured the BCIPHIPP metabolite in 100% of mothers and their children. Maximum concentrations in urine for mothers and children were 104 ng/mL and 23.2 ng/mL, respectively [15]. TCPH has also been detected in breast milk in Sweden at concentrations up to 82 ng/g lipid [17].

EPA considers TCPH to have high hazard for persistence and low hazard for bioaccumulation [1]. In rats, TCPH is readily absorbed, is widely distributed to tissues especially the liver and kidney, and is excreted primarily in urine but also bile and feces. Tissue elimination time was slowest from adipose tissue (adipose  $T_{1/2}$  = 103 hours) [4].

**References**

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